Food Stamp Benefits and Child Poverty

Dean Jolliffe, Craig Gundersen, Laura Tiehen, and Joshua Winicki

In 2000, 8.8 million children lived in households participating in the Food Stamp Program, making this assistance program a crucial component of the social safety net. Despite its importance, little research has examined food stamps' effect on children's overall well-being. Using the Current Population Survey from 1989 to 2001, we consider the impact of food stamps on three measures of poverty—the headcount, the poverty gap, and the squared poverty gap. We find that in comparison to the headcount measure, food stamp benefits lead to large reductions in the poverty gap and squared poverty gap measures.

Key words: child poverty, current population survey, food stamps.

The 1977 Food Stamp Act states that "in order to promote the general welfare, [it is the policy of Congress] to safeguard the health and well-being of the Nation's population by raising levels of nutrition among low-income households" (Title 7, Section 2011 of the U.S. Code of Law). There are many studies on the effectiveness of the Food Stamp Program (FSP) in achieving the direct goal of raising the nutritional well-being of low-income households. For example, Breunig et al. examine the impact of food stamps on food expenditures; Wilde, McNamara, and Ranney study whether food stamps improve dietary quality; and Gundersen and Oliveira examine the links between food stamps and food insecurity. Relatively less work has assessed the effectiveness of food stamps as a policy instrument to promote the general welfare of the population.

One commonly used indicator of general welfare is poverty, and the purpose of this article is to examine the role of food stamps in alleviating child poverty. There has been some research on this issue including Cunnyngham (2001, table 3.2) and Dalaker and Proctor who examine the incidence of poverty after the inclusion of food stamp and other in-kind benefits. Bishop, Formby, and Zeager examine the effect of food stamps on reducing poverty and improving the well-being of the poor during the 1980s. They show that the FSP had become more effective between 1982 and 1990 in reducing the income deficiencies of the poor. Scholz and Levine also examine the role of FSP in reducing poverty by estimating the extent to which food stamp benefits reduce the sum difference between the poverty line and the incomes of the poor in 1997.

We extend this limited literature in three ways. First, we examine child poverty to bring focus to an important sub-population that has much higher rates of poverty than the general population. Second, we consider the effect of food stamps on measures that reflect the depth and severity of poverty rather than just the incidence of poverty. This extension is particularly relevant since the value of food stamp benefits declines as a household's income increases. Third, we examine the potential influence of changes in the Food Stamp Program on poverty. We consider what would happen under alternative distributions of food stamp benefits and what would happen if the number of participants increased.

The motivation for this article is to understand how well the largest U.S. food assistance program performs in improving the welfare of poor children. In 2000, 17.1 million persons lived in low-income households that participated in the FSP, and of these program participants, 8.8 million were children (Cunnyngham 2001, table A-34). This article examines the extent to which food stamp benefits can reduce the burden of child poverty and also to explore

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how potential modifications to the program would alter the well-being of poor children.[1]

We begin with a review of the Food Stamp Program and its eligibility requirements. We then discuss the poverty measures and data used in this article. We use the Current Population Survey (CPS) to examine poverty from 1988 to 2000. By using multiple years, we can analyze how the effect of food stamps might differ during expansions and recessions, and how the effect might differ before and after implementation of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (welfare reform). We measure the impact of food stamps on child poverty under the current benefit structure and follow this by considering several scenarios of alternative distributions of benefits and changes in the composition of participating households.

Food Stamp Program Details and the Data

The Food Stamp Program is the largest U.S. food assistance program, serving approximately 17.2 million individuals in 2000 with an annual benefit distribution of $15 billion, or approximately $73 in monthly benefits per person.[2] Participants receive benefits for the purchase of food in authorized, privately run stores selling food to participants and nonparticipants. Food stamps cannot be used to purchase nonfood items such as soap, toiletries, household paper products, prepared foods, or medicines.[3] Between 1988 and 2000, 47% of all food stamp program participants were children, and in 2000 approximately 57% of food stamp households include children.

With a few exceptions, this cornerstone of food assistance programs is available to all citizens who meet income and asset tests.[4] To receive food stamps, households must meet three financial criteria: the gross income, net income, and asset tests. A household's gross income before taxes in the previous month must be at or below 130% of the poverty line ($1,533 per month in fiscal year 2000 for a three-person household, the most common food stamp household). Households with someone over the age of sixty are exempt from this test, though they still face the other tests. In addition to the gross income test, a household must have a net monthly income at or below the poverty line.[5] Finally, income-eligible households with assets less than $2,000 qualify for the program ($3,000 for households with someone over age sixty). Households in which all members receive Temporary Assistance for Needy Families (TANF) or Supplemental Security Income (SSI) are categorically eligible for food stamps.

The Current Population Survey

To measure the effect of food stamps on poverty, we use data from the March Supplement of the Current Population Survey (CPS). The CPS is administered monthly by the Census Bureau for the Bureau of Labor Statistics to approximately 50,000 households. The survey collects data from a nationally representative sample of households on employment, unemployment, earnings, occupation, and hours of work. Respondents to the CPS provide information on several different sources of income, including noncash income sources such as food stamps.

We use CPS data for this analysis because they are the source for official U.S. poverty estimation and our analysis is focused on how food stamps affect poverty. We consider the effect of adding the value of food stamps to household income and compare several measures of poverty with and without food stamp benefits. In performing this analysis, we are particularly concerned about matching the official poverty estimates and the CPS allows us to do this.

[1] This article also adds some insight to the National Academy of Science's Panel on Poverty and Family Assistance recommendation that the value of food-stamp benefits be included in the definition of family resources for the estimation of poverty (Citro and Michael, p. 66). While the Panel recommends several changes, the analysis in this article illustrates the marginal impact of this change alone on the official poverty rate.

[2] Total federal expenditures on the Food Stamp Program, including the federal share of state administrative expenses, amounts to $18.3 billion in 2000, which is almost 60% of the total expenditure on all domestic food and nutrition assistance programs. The next two largest food assistance programs are the National School Lunch and Breakfast Programs ($9.5 billion) and Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) ($4.0 billion).

[3] More program details are at www.ers.usda.gov/briefing/foodstamps/.

[4] The 1996 welfare reform legislation disqualified most permanent resident noncitizens from receipt of food stamps. Eligibility requirements changed by 2003 allowing all legal immigrants who have been in the U.S. continuously for 5 years (and all legal immigrant children, regardless of date of entry to the U.S.) to apply for food stamps. When relevant, eligibility guidelines for legal immigrants take into account the income and assets of sponsors, except in applications made for children.

[5] Net income is derived from gross income by subtracting a standard deduction plus other adjustments. These adjustments include additional deductions for: labor market earnings (up to 20% of earnings), child care expenses, expenses for medical care of disabled dependants, and a shelter deduction for costs in excess of 50% of a household's net income.

A shortcoming of the CPS is that it underestimates the number of food stamp program participants and the value of food stamp benefits. Our estimates indicate that on average, the CPS underestimates total participation in comparison to the program administrative data by 13%. The CPS data also indicate that between 1988 and 2000, the total value of food stamp benefits is equal to 82% of the value as estimated by the administrative data.

While it is important to keep this measurement issue in mind, we note that the problem of underreporting food stamp receipt is not unique to the CPS. Bollinger and David note that the 1984 Survey of Income and Program Participation (SIPP) underestimate program participation by 13%, which is approximately the same value we find for the CPS from 1988 to 2000. This comparison is particularly noteworthy as the SIPP is designed to address issues related to participation in government assistance programs.

Measures of Poverty and Sampling Variance

The baseline measure of welfare used in this article is income as it is defined for federal poverty rates. This definition includes all pretax income, but does not include capital gains nor any noncash benefits such as public housing, Medicaid, and (of particular relevance for this analysis) food stamps. The poverty lines used in this article are the U.S. Federal Government poverty thresholds, which were developed in 1965 following a cost-of-basic-needs methodology. The poverty thresholds vary for persons of different ages and families of different sizes. In 2000, for example, the poverty threshold is set at $8,959 for an individual under sixty-five years of age, $11,869 for a two-person family with one child and one adult, and $20,550 for a family with two adults and three children.[6] If family income is less than the poverty threshold, then all members of the family are poor. The rate of child poverty (or headcount index) is the proportion of children living in poor families relative to the total number of children. We similarly compute the other child poverty indices by assigning to each child their family's income and poverty threshold.

To understand the effect of food stamps on poverty, we examine how supplementing income with food stamps affects the headcount, poverty gap, and squared poverty gap poverty indices. These three measures are from the frequently used Foster–Greer–Thorbecke (hereafter referred to as FGT) family of poverty indices. The headcount is simply the proportion of persons living in poverty, or the incidence of poverty. The poverty gap index measures the depth of poverty and is defined by the mean distance below the poverty line, where the mean is formed over the entire population (the nonpoor are counted as having zero poverty gap). The third measure is the squared poverty gap index, which provides a measure of the severity of poverty, and is defined as the mean of the squared proportionate poverty gaps.

The FGT class of poverty indices, also referred to as P_α, can be represented as:

$$(1) \qquad P_\alpha = 1/n \sum_i I(y_i < z)[(z - y_i)/z]^\alpha$$

where n is the sample size, i subscripts the individual or household, y is the relevant measure of welfare, z is the poverty line, and I is an indicator function that takes the value of one if the statement is true and zero otherwise. When $\alpha = 0$, the resulting measure is the headcount index, or P_0. When $\alpha = 1$, the FGT index results in the poverty gap index, or P_1 and the squared poverty gap index (P_2) results when $\alpha = 2$.

The FGT class of poverty measures possesses several desirable characteristics. For example, the FGT poverty measures are additively decomposable so a national FGT estimate can be represented as the weighted average of, say, regional FGT estimates. For $\alpha > 0$, the FGT also satisfies the property of monotonicity; in other words, if a poor person is made less well-off and everyone else stays the same then the poverty index increases. For $\alpha > 1$, the FGT measure satisfies the transfer principle, which means that any regressive transfer (a transfer from a poor person to a less poor person) increases poverty.

The usefulness of these measures can be illustrated by considering a transfer of money from a rich person to a poor person that is not large enough to move the poor person above the poverty line. This transfer has no effect on the headcount index, but the poor person is better off and this welfare improvement is reflected in a reduction of both the poverty gap and squared poverty gap indices. As another example, a transfer of income from a poor

[6] For a complete listing of the poverty thresholds for individuals and families of various sizes, see the U.S. Census Bureau's web page on poverty at: www.census.gov/hhes/www/poverty.html.

person to a poorer person will not alter either the headcount or the poverty gap index, but it improves the distribution of income of the poor and this change is reflected by a reduction of the squared poverty gap index.[7]

These examples point to an important reason to consider the poverty gap and squared poverty gap indices in addition to the commonly reported headcount index. While the Food Stamp Program mitigates the negative effects of poverty, the benefit level typically declines as income increases. This progressive benefit delivery policy will by design have a greater impact on reducing the depth and severity of poverty than the incidence of poverty.

To examine the efficacy of food stamps in reducing poverty, one needs both measures of poverty and measures of their sampling variance. Without standard errors for the poverty indices, it is not possible to know if changes in poverty are statistically significant or an artifact of the sampling procedure. The decomposability of the FGT poverty indices greatly simplifies the derivation of standard errors for the poverty measures. Decomposability means that P_α can be expressed as the weighted sum of r regional P_αs, or $P_\alpha = \sum_r \omega_r P_{\alpha,r}$ where ω_r is n_r/n, or the sample weight for region r and $P_{\alpha,r}$ is the FGT poverty measure for region r. While decomposability is typically considered in terms of regions, it can be extended to individuals. This extension means that P_α can be expressed as a weighted average of n individual-level measures of P_α. This trivial extension simplifies deriving the sampling variance, since variance for P_α can be estimated following the standard formula for estimating the variance of a mean.

If the CPS data were selected using a simple random sample (SRS), then a consistent estimator of the variance of P_α is:

$$(2) \qquad \widehat{V}(P_\alpha) = (n(n-1))^{-1} \sum_{i=1}^{n} (P_{\alpha,i} - \hat{P}_\alpha)^2.$$

The CPS data, though, are not from a SRS, but are from a stratified, multi-stage sample design. Howes and Lanjouw show that the estimated standard errors for the FGT poverty indices can have large biases when incorrect assumptions are made about the sample design. In particular, they show that if the sample design is multi-staged, but standard errors are derived from equation (2), then the standard errors will significantly underestimate the true sampling variance.

The result of Howes and Lanjouw follows from the classic work of Kish who shows that the variance of an estimated mean typically increases when the sample is drawn from a multi-stage design rather than a SRS design. Kish provides an estimator for sampling variance of an estimated mean from a weighted, stratified, clustered sample. Because P_α is a weighted mean, we can modify Kish's result to give the estimated variance of P_α from a complex sample design as:

$$(3) \qquad \widehat{V}(P_{\alpha,w}) = \sum_{h=1}^{L} (n_h(n_h-1))^{-1} \times \sum_{i=1}^{n_h} \left(\sum_{j=1}^{m_{h,i}} w_{h,i,j} P_{\alpha,h,i,j} - \sum_{i=1}^{n_h} \sum_{j=1}^{m_{h,i}} w_{h,i,j} P_{\alpha,h,i,j} \right)^2$$

where h subscripts each of the L strata, i subscripts the cluster or primary sampling unit (PSU) in each stratum, j subscripts the ultimate sampling unit (USU), so w_{hij} denotes the weight for element j in PSU i and stratum h. The number of PSUs in stratum h is denoted by n_h, and the number of USUs in PSU (h, i) is denoted by m_{hi} (see Jolliffe and Semykina for more details).

The estimation of equation (3) is straightforward if one has access to the sample design information. In the case of the CPS data, this information has been censored from the public-use data files. To overcome this difficulty, we use an estimation strategy of creating synthetic design variables that induce a similar design effect for variance estimation. The first step of this approach is to sort the data by income.[8] Then each set of four consecutive housing units is assigned to a separate cluster. The purpose of the sorting is to induce a high level of intracluster correlation, and the choice of four matches the average cluster size of the CPS. We select as the synthetic strata the four regions of the United States (Northeast, Midwest, South, and West). These synthetic cluster

[7] Unlike the Sen or Kakwani poverty indices, the squared poverty gap index also satisfies "subgroup consistency" which means that if poverty increases in any subgroup, and does not decrease elsewhere, then aggregate poverty must increase (Foster and Shorrocks).

[8] The methodology requires sorting the data on the variable most relevant to the analysis.

Table 1. Rates of Poverty and Child Poverty, 1988–2000

	Headcount Index		Poverty Gap		Squared Poverty Gap	
	Children	Persons	Children	Persons	Children	Persons
1988	19.5 (0.41)	13.0 (0.21)	9.1 (0.24)	5.7 (0.12)	5.7 (0.18)	3.5 (0.09)
1991	21.8 (0.41)	14.2 (0.21)	10.2 (0.23)	6.2 (0.12)	6.4 (0.18)	3.9 (0.09)
1994	21.8 (0.43)	14.5 (0.22)	10.2 (0.25)	6.5 (0.12)	6.4 (0.19)	4.2 (0.09)
1997	19.9 (0.43)	13.3 (0.22)	9.3 (0.25)	6.0 (0.12)	6.0 (0.20)	4.0 (0.10)
2000	16.1 (0.39)	11.3 (0.20)	7.2 (0.21)	5.1 (0.11)	4.6 (0.17)	3.4 (0.09)

Notes: All poverty indices are multiplied by 100. The first column under each of the three indices lists the child poverty rates and the second column lists the poverty rate for the full sample. Estimates are based on CPS March Supplement data and standard errors (in parentheses) are corrected for sample-design effects following Jolliffe.

and strata variables are then passed to equation (3) to estimate the sampling variance. See Jolliffe for a more detailed description of the approach.

Results

Table 1 lists poverty and child poverty rates from 1988 to 2000.[9] These estimates use income (but do not include food stamps) as the measure of welfare and form a baseline for comparison with later tables (which do include food stamps). For the sake of parsimony, we only report results for every third year beginning in 1988. Table 1 verifies the well-known result that the proportion of children living in poverty, or the child headcount index, is much higher than for the entire population. For example, in 2000 16.1% of all children were poor versus 11.3% of all persons. Between 1988 and 2000, the child headcount index was on average 50% higher than the headcount index for the population, and the difference was statistically significant in all years.[10] Table 1 also shows that the poverty gap and squared poverty gap indices are higher for children than for the total population. For example, in 1991 the child poverty gap index is 0.10 while the estimate for all persons is 0.06, a difference of 65%.

Poverty Levels and Food Stamp Benefits

Our next step is to examine the impact of food stamps on child poverty. Table 2 lists child poverty rates for each of the three poverty measures with the value of food stamps added to income. More precisely, the columns labeled "Income + Stamps" in table 2 report:

$$(4)\qquad P'_\alpha = 1/n \sum_i I(\{y_i + \text{fsb}_i\} < z) \times [(z - \{y_i + \text{fsb}_i\})/z]^\alpha$$

where fsb_i is the value of food stamp benefits for household i, and all other terms are defined as in equation (1). The next column reports the percentage decline in child poverty from including food stamp benefits, $[(P_\alpha - P'_\alpha)/P_\alpha] \times 100$; in other words, the percentage difference between the results from equations (4) and (1). Standard errors for the relative decline in poverty are estimated as a second-order Taylor series expansion:[11]

$$(5)\qquad \widehat{V}[(P_\alpha - P'_\alpha)/P_\alpha] = \frac{1}{\hat{P}^2_\alpha} V(P'_\alpha) + \frac{\hat{P}'^2_\alpha}{\hat{P}^4_\alpha} V(P_\alpha) - \left\{ \frac{\hat{P}'_\alpha}{\hat{P}^3_\alpha} V(P_\alpha) \right\}^2.$$

From 1991 to 1996, the peak caseload years for the FSP, the decline in the headcount index from food stamps was between 5.9% and 7.4%. As seen in table 2 (Panel A), before and after this period, the percentage decline was less than 6%, and in both 1988 and 2000 the decline was not statistically significant. In 2000, the headcount index was 16.1 and this fell to 15.4 when food stamps were added. This decline by 4.3% means that the supplemented income brought half a million children over the poverty line. This change is qualitatively

[9] For the sake of parsimony, we only report results for every third year beginning in 1988. Results for all years are available from the authors.

[10] We follow Howes and Lanjouw to correct the standard errors and test for differences in P_0, P_1, and P_2. Over the thirteen years, and for all three poverty measures, the child poverty rate is higher than the overall poverty rate with p-values that are much less than 0.0001. As a robustness test, we also verify that this finding holds when we consider an alternative poverty line set at 130% of the official line. These results are available from the authors upon request.

[11] For details of the Taylor series approximation methodology, see chapter 6 of Wolter.

Table 2. Percentage Reduction in Child Poverty from Food Stamps, 1988–2000

	Headcount Index		Poverty Gap		Squared Poverty Gap	
	Income + Stamps	Percent Decline	Income + Stamps	Percent Decline	Income + Stamps	Percent Decline
Panel A: U.S. poverty thresholds						
1988	18.8 (0.41)	3.7 (2.92)	7.3 (0.20)	19.9*** (3.00)	4.1 (0.14)	28.4*** (3.35)
1991	20.5 (0.40)	5.9** (2.53)	7.9 (0.19)	22.6*** (2.55)	4.4 (0.13)	31.7*** (2.80)
1994	20.4 (0.42)	6.7** (2.63)	7.9 (0.20)	22.7*** (2.69)	4.4 (0.14)	31.8*** (2.95)
1997	18.7 (0.42)	5.8** (2.91)	7.6 (0.21)	18.6*** (3.13)	4.5 (0.16)	26.1*** (3.57)
2000	15.4 (0.38)	4.3 (3.35)	6.2 (0.19)	13.9*** (3.69)	3.7 (0.14)	19.7*** (4.25)
Panel B: Square root of family size						
1988	18.6 (0.40)	4.1 (2.88)	7.2 (0.19)	20.1*** (2.94)	4.0 (0.14)	28.3*** (3.30)
1991	20.2 (0.39)	6.0** (2.51)	7.8 (0.18)	22.6*** (2.49)	4.3 (0.13)	31.4*** (2.75)
1994	20.0 (0.41)	7.3*** (2.60)	7.8 (0.19)	22.8*** (2.67)	4.3 (0.14)	31.8*** (2.96)
1997	18.5 (0.41)	5.4* (2.91)	7.5 (0.21)	18.6*** (3.11)	4.4 (0.16)	26.0*** (3.53)
2000	15.2 (0.38)	4.5 (3.30)	6.2 (0.19)	13.7*** (3.70)	3.7 (0.14)	19.5*** (4.30)
Panel C: Per capita income						
1988	41.9 (0.48)	0.4 (1.61)	19.1 (0.29)	5.2** (2.05)	11.6 (0.22)	10.7*** (2.45)
1991	44.3 (0.46)	0.5 (1.45)	20.4 (0.28)	6.4*** (1.81)	12.4 (0.21)	12.6*** (2.12)
1994	43.9 (0.47)	0.3 (1.51)	20.4 (0.29)	6.5*** (1.92)	12.4 (0.23)	12.8*** (2.26)
1997	41.4 (0.49)	0.4 (1.66)	19.1 (0.30)	5.3** (2.13)	11.7 (0.24)	10.5*** (2.56)
2000	37.2 (0.49)	0.4 (1.86)	16.7 (0.29)	3.6 (2.37)	10.0 (0.22)	7.4** (2.89)

Notes: See notes for table 1. The first column under each of the poverty indices estimates child poverty with food stamp benefits added to income. The second column under each index lists the percent decline in the index after inclusion of food stamp benefits. The estimated reduction is superscripted with *, **, or *** if the *p*-value is less than 0.1, 0.05, or 0.01, respectively. Panels B and C consider alternate assumptions on adult equivalence and economies of scale.

significant, but given that in 2000 there were over 11.6 million poor children, the change in the headcount index fails to measure much of the poverty alleviation properties of the transfers.

The reason that adding FSP benefits to income does little to decrease the incidence of poverty, P_0, is because benefits are negatively related to income. In general, only a subset of poor households will receive enough in food stamp benefits to actually lift them above the poverty line. Not only is the effect of food stamp benefits on the headcount index limited to a proportion of potential food stamp program participants, but Cunnyngham (2002, table 5) shows that participation rates of households with higher incomes is lower than for poorer households.[12] It is the poor whose income is closest to the poverty line that are most likely to be lifted out of poverty after the inclusion of the food stamp benefits, but these are the households least likely to participate. In contrast, lower-income poor households have higher participation rates, but the addition of the value of the food stamp benefits to their income is unlikely to lift them out of poverty and will therefore have no impact on the headcount index (though it will reduce the P_1 and P_2 indices).

Consistent with these two insights, the estimates in Panel A of table 2 reveal that while the headcount index is little changed by the inclusion of food stamp benefits, both the poverty gap and squared poverty gaps are significantly changed by the inclusion of food stamp benefits. During the early and mid-1990s, supplementing income by the value of food stamps had the effect of reducing the child poverty gap index by more than 20% and reducing the squared poverty gap index by about 30%.[13] These poverty reductions are much greater than when just considering the change in the headcount index.

Implicit in any analysis of child poverty (and poverty in general) is some assumption about the relationship between family size and needs. Does a family of four require twice as much

[12] Cunnyngham (2002) also shows that the relative difference in participation rates between higher-income and lower-income eligibles declined in the mid to late 1990s. Non-participation by eligible households has been ascribed to the costs (in the form of stigma and transactions costs) exceeding the benefits from participation. See Moffitt and Ranney and Kushman.

[13] One interpretation of the poverty gap index is that it equals the product of the headcount index and the income gap, where the income gap is the average shortfall of the poor as a fraction of the poverty line. The results in tables 1 and 2 indicate that, for example, in 1994, the average shortfall for poor children was 47%, but when supplemented with food stamps the shortfall declined to 39% of the poverty line.

income as a two-person family to meet basic needs? If so, then one might assume that the appropriate individual measure of welfare is per capita income (family income divided by family size). Alternatively, if it is assumed that there are fixed costs in the provision of basic needs (e.g., shelter), then family income would be divided by some fraction of family size. For a detailed analysis of this issue, see Lanjouw and Ravallion, and Buhmann et al.

One common approach to this issue is to assume that the needs of a family comprised of A adults and C children can be described by $(A + pC)^f$ where p adjusts for differences in needs between adults and children (or in other words, converts children into adult equivalents) and f adjusts for economies of scale in family size. The federal poverty thresholds used in this analysis provide forty-eight separate thresholds for families of various sizes. Cutler and Katz have shown that these thresholds can be approximated by using the official poverty threshold for a single adult (under the age of sixty-five) as a base and setting $f = 0.61$ and $p = 0.76$.

In order to examine the sensitivity of the findings in Panel A of table 2 to changes in assumptions regarding adult equivalence and economies of scale, we consider two alternate assumptions. Panel B reports the change in the three poverty measures when total income is divided by the square root of family size ($p = 1, f = 0.5$). Johnson and Torrey note that this adjustment is becoming common in international poverty comparisons, and for examples of child poverty analysis that use this adjustment, see Vleminckx and Smeeding. As an additional comparison, Panel C examines the case where per capita income is the measure of individual welfare ($p = 1, f = 1$). Across both Panels B and C, the pattern persists. Supplementing income by the value of food stamps has the effect of reducing the child poverty gap and squared poverty gap indices by much larger amounts than the reduction in the headcount index.

The findings summarized in Panel A are displayed in figure 1 which plots the percent reduction for each measure of child poverty by year. This figure clearly reveals that the percent decline is largest for the squared poverty gap, followed by the poverty gap index, and both of these are significantly greater than the decline in the headcount index over all years considered.

Figure 1 also suggests that the effectiveness of food stamps in reducing child poverty peaked between 1991 and 1994, when the FSP caseload was high, and then declined during the post-welfare reform period and the years of economic expansion. The greatest change occurred immediately after welfare reform, and

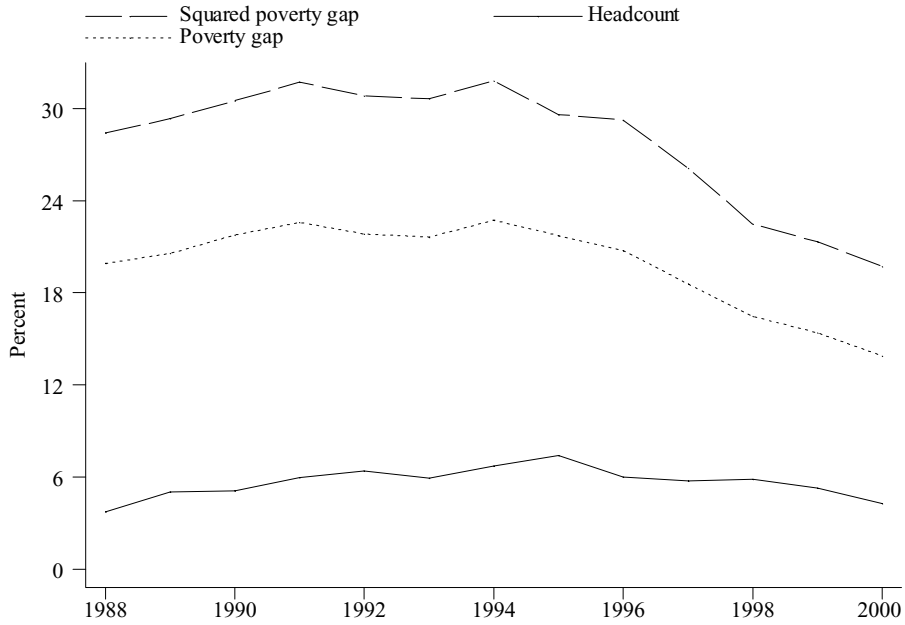

Figure 1. Percentage reduction in child poverty from food stamps

the fall in FSP participation post-1996 largely explains why all three measures of poverty indicate less effect in reducing poverty.

The largest change in the effectiveness of the FSP in reducing child poverty after 1996 is seen in the squared poverty gap. In 1996, food stamps reduced the child, squared poverty gap by 29%, but by 1998 the reduction was only 23%. The reason P_2 is most affected at this time is because the drop in participation has disproportionately come from those persons with lower incomes. For example, Cunnyngham (2002, table 5) shows that participation rates for those whose income is between 100% and 130% of the poverty line declined slightly from 29% in 1995 to 26% in 1999. In contrast, participation rates declined by much more (from 105% in 1995 to 83% in 1999) for those FSP-eligible individuals with income between 1% and 50% of the poverty line.[14] The largest change in the squared poverty gap index comes from income increases to the poorest persons, but after the mid-1990s the FSP participation rates decline for this group.

Policy Simulations of Food Stamp Program Changes

The previous section demonstrates how the current structure of food stamp benefits helps alleviate child poverty in the U.S. We now simulate how the impact of food stamps may differ if benefits are targeted more toward those children lower in the income distribution and if a larger number of households participate.[15] For all simulations, we estimate the impact of a hypothetical change in the FSP on each of the three poverty measures for all years from 1988 to 2000. Again, we only report results for every third year beginning in 1988.

In interpreting the simulation results, it is important to note two issues. The first is that we do not consider the potential behavioral effects of the simulated changes on households. The second is that we only assess the impact of the simulation in terms of changes in poverty levels. There are certainly many other indicators, such as hunger, food insecurity, overall health status, that are affected by these simulations, and these are left unexamined in this article.

In the first simulation, we consider the effect of an across-the-board increase in the value of benefit distributions by 10% and 20%. Considering an untargeted increase in the size of the Food Stamp Program allows us to examine the efficacy of a large increase in benefits to all current participants in reducing poverty relative to more targeted changes in the distribution of food stamps. Also, to the extent that the CPS underestimation of food stamp benefits results from self-declared program participants underreporting their benefit level, this simulation serves an ancillary purpose of providing some evidence on the robustness of the results reported in table 2 to the underreporting of benefits.

Panel A of table 3 reports the change in the child poverty indices from increasing the level of benefits to all current participants by 10%, and Panel B reports the change due to an increase of 20%. Since all simulations are based on CPS data, increasing benefits by 10% means increasing the size of benefit distribution on average by $1.1 billion. For all simulations, the effect of the simulated increase is contrasted with the poverty estimates from table 2 where the value of the food stamps is added to income. The results indicate that this large increase in the Food Stamp Program would lead to only a small change in child poverty.

There are no statistically significant changes in poverty from the 10% increase for any of the poverty measures or years examined. When considering an increase of 20%, there is remarkably only one statistically significant reduction in the level of poverty. In 1991, the poverty gap index would have been 5.4% less if food stamp benefits had been 20% greater. This simulation suggests that a general increase in food stamp benefits of more than $2 billion is unlikely to have a large effect on reducing poverty. The simulation also indicates that the estimates in table 2 are reasonably robust to the issue of measurement error. Adding 10% and 20% to benefit receipt does not significantly affect the estimated levels of poverty.

The remaining two simulations increase benefit levels to households with income less than the poverty line. The amount of the increase in benefits to the poor is set to equal the total amount of food stamp benefits received by nonpoor households. One interpretation of these simulations is that they are

[14] To estimate official participation rates, the Food and Nutrition Service of the U.S. Department of Agriculture calculates the number of recipients from administrative records and the eligible population from survey data. Because participation is the ratio of two estimates that are based on separate data sources, it is possible for the participation rate to be over 100%.

[15] We refer to transfers to lower income persons as targeted because we examine the impact of food stamps on poverty. This does not mean that the simulated transfers are better targeted to reach the direct program goal of raising the nutritional well-being of low-income households.

Table 3. Reduction in Child Poverty from a 10% to 20% Increase in Benefits to All Recipients (Simulation 1)

	Headcount Index		Poverty Gap		Squared Poverty Gap	
	Income + Transfer	Percent Decline	Income + Transfer	Percent Decline	Income + Transfer	Percent Decline
Panel A: Increase benefits by 10%						
1988	18.7 (0.41)	0.6 (3.05)	7.2 (0.20)	2.4 (3.76)	4.0 (0.14)	3.0 (4.83)
1991	20.3 (0.40)	0.7 (2.73)	7.7 (0.19)	2.7 (3.28)	4.2 (0.13)	3.4 (4.20)
1994	20.2 (0.42)	0.9 (2.87)	7.7 (0.20)	2.7 (3.47)	4.2 (0.14)	3.4 (4.37)
1997	18.5 (0.42)	1.0 (3.12)	7.4 (0.21)	2.1 (3.84)	4.3 (0.16)	2.7 (4.92)
2000	15.3 (0.38)	0.6 (3.52)	6.1 (0.19)	1.5 (4.28)	3.6 (0.14)	1.9 (5.33)
Panel B: Increase benefits by 20%						
1988	18.6 (0.41)	1.3 (3.04)	7.0 (0.20)	4.7 (3.69)	3.8 (0.14)	5.8 (4.73)
1991	20.1 (0.40)	1.5 (2.71)	7.4 (0.19)	5.4* (3.20)	4.1 (0.13)	6.6 (4.09)
1994	19.9 (0.42)	2.2 (2.84)	7.5 (0.20)	5.4 (3.39)	4.1 (0.14)	6.6 (4.26)
1997	18.4 (0.42)	1.8 (3.10)	7.3 (0.21)	4.2 (3.77)	4.2 (0.16)	5.2 (4.83)
2000	15.2 (0.38)	1.3 (3.50)	6.0 (0.19)	3.0 (4.22)	3.6 (0.14)	3.8 (5.25)

Note: See notes for table 2.

revenue-neutral changes in the distribution of benefits that take food stamp benefits away from nonpoor households and redistribute them to poor households. We use the term nonpoor simply to denote those households whose income is greater than the poverty line. An alternative way to consider the simulations is to say that benefit levels to the poor households are increased by an amount equal to the benefit levels received by nonpoor households. This alternative description would require a large increase in the total value of food stamps distributed, but the effect on the poverty indices would be identical because nonpoor persons carry zero weight in the poverty indices.

In the second simulation, we increase benefits to all poor households with children currently receiving food stamps by a total amount equal to that received by all nonpoor households. This simulation could be implemented by increasing the maximum benefit level and reducing the net income deduction for those households with children.[16] The third simulation transfers this same amount, but targets poor households with children *not* receiving food stamps. In both of these simulations, we first distribute the additional benefits to the poor (Panel A) and then to poor households whose income is less than one half the poverty line (Panel B), which we refer to as the extreme poor.

Panels A and B of table 4 report the simulation results from transferring the additional food stamp benefits to poor (and extreme poor) households that are FSP participants (hereafter referred to as FSP households) and have children. The value of the transfer to each household is proportional to the household's income gap (i.e., the difference between income and the poverty line). Using 2000 as an example, the total income gap of poor FSP households with children was $18 billion and the total value of food stamps received by nonpoor FSP households was $3.6 billion, an amount equal to 20% of the income gap. The simulation then transfers a total of $3.6 billion to the poor FSP households with children, and the supplemental amount received by each household is equal to 20% of their income gap. Consider an FSP household with children and income that is $100 short of the poverty line. In the simulation, this household receives their normal level of food stamps plus an additional $20 worth of food stamps.

The qualitative nature of the results is similar across the two panels. There is essentially no effect on the incidence of child poverty, but the depth and severity (as measured by the poverty gap and squared poverty gap indices) are significantly reduced.[17] The decline in the child poverty gap index resulting from the transfer to the poor FSP households with children ranges from 7% to 13%, and the reduction is slightly greater for the transfer to the extreme

[16] For details on how benefit levels are set, see Wilde.

[17] A household can become nonpoor from the simulation if the sum of their income, initial food stamp benefits, and the additional benefits from the simulation is greater than their poverty line.

Table 4. Reduction in Child Poverty from Transferring Benefits from Nonpoor to Poor FSP Households with Children (Simulation 2)

	Headcount Index		Poverty Gap		Squared Poverty Gap	
	Income + Transfer	Percent Decline	Income + Transfer	Percent Decline	Income + Transfer	Percent Decline
Panel A: Transfer to all poor, FSP households with children						
1988	18.7 (0.41)	0.6 (3.05)	6.8 (0.20)	7.1** (3.58)	3.6 (0.14)	10.7** (4.48)
1991	20.3 (0.40)	1.0 (2.73)	7.1 (0.19)	10.3*** (3.05)	3.7 (0.13)	15.1*** (3.79)
1994	20.0 (0.42)	1.8 (2.85)	6.8 (0.20)	13.2*** (3.13)	3.5 (0.14)	18.7*** (3.80)
1997	18.5 (0.42)	1.3 (3.10)	6.8 (0.21)	10.0*** (3.53)	3.8 (0.16)	14.3*** (4.39)
2000	15.2 (0.38)	1.4 (3.49)	5.5 (0.19)	11.1*** (3.90)	3.1 (0.14)	15.9*** (4.72)
Panel B: Transfer to extreme-poor, FSP households with children						
1988	18.8 (0.41)	0.0 (3.06)	6.8 (0.20)	7.4** (3.54)	3.6 (0.14)	13.0*** (4.37)
1991	20.5 (0.40)	0.0 (2.75)	7.0 (0.19)	10.6*** (3.01)	3.6 (0.13)	17.8*** (3.67)
1994	20.4 (0.42)	0.1 (2.88)	6.8 (0.20)	13.9*** (3.06)	3.4 (0.14)	22.1*** (3.66)
1997	18.7 (0.42)	0.1 (3.13)	6.8 (0.21)	10.4*** (3.49)	3.7 (0.16)	16.8*** (4.28)
2000	15.4 (0.38)	0.0 (3.53)	5.5 (0.19)	11.5*** (3.84)	3.0 (0.14)	18.5*** (4.58)

Note: See notes for table 2.

poor. The decline in the squared poverty gap index is the largest change and ranges from 11% to 19% when targeting poor FSP households and from 13% to 22% when targeting the extreme-poor FSP households with children.

With the third simulation, we try to shed some light on the impact of delivering benefits to non-FSP poor households. Depending on the estimation method, between 30% and 50% of eligible households do not receive food stamps (Blank and Ruggles, Castner and Cody). We do not attempt to impute values for the eligibility requirements to identify the eligible population, but rather we consider the simpler simulation of distributing benefits to all poor, non-FSP households with children. We believe this exercise is useful both because it helps us understand the impact of expanding food stamp coverage to poor persons and because it sheds some light on the benefit of expanding participation rates of the eligible population. This second reason is based on the assumption that a large percentage of poor persons are eligible for food stamps.[18]

In this third simulation, the same amount of additional benefits is redistributed as in the previous simulation (an amount equal to the benefits received by the nonpoor households) and the amount transferred to each household is again proportional to the household's income gap. As an example, consider again that in 2000, the total income gap for all poor, non-FSP households with children was $31.4 billion. The amount to be redistributed is again $3.6 billion in food stamps. This means that each non-FSP household with children receives an amount equal to 11.5% ($31.4 \times 0.115 = 3.6$) of the household's income gap.

In this last simulation, it is not possible for a household to become nonpoor because the sum of their income and the transfer amount (a fraction of their income gap) will always be less than their poverty line. (In the previous simulation, in contrast, households could become nonpoor because they also had an initial allocation of food stamps.) For this reason, there is no change in the headcount index when the transfer is targeted to either the poor or extreme-poor non-FSP households with children. Panel A of table 5 reveals that when the redistribution of food stamps is targeted to the poor, non-FSP households with children, the poverty gap index declines by 8.5% and the squared poverty gap index by 17.8% on average. The estimates from Panel B, with the transfer focused on the extreme poor, show that the decline in the poverty gap is slightly less, while the decline in the squared poverty gap is larger.

A comparison of tables 4 and 5 shows that the simulation based on increasing benefits to FSP households has a greater effect on reducing the child poverty gap index, in comparison to the simulation based on transferring the same amount to non-FSP households. When considering the squared poverty gap index, though, the reverse is true: targeting poor,

[18] Income-poor households would be FSP ineligible if they fail the asset test.

Table 5. Reduction in Child Poverty from Transferring Benefits from Nonpoor to Poor, Non-FSP Households with Children (Simulation 3)

	Headcount Index		Poverty Gap		Squared Poverty Gap	
	Income + Transfer	Percent Decline	Income + Transfer	Percent Decline	Income + Transfer	Percent Decline
Panel A: Transfer to all poor, non-FSP households with children						
1988	18.8 (0.41)	0	6.9 (0.20)	6.0* (3.59)	3.5 (0.14)	13.1*** (4.24)
1991	20.5 (0.40)	0	7.2 (0.19)	8.7*** (3.08)	3.6 (0.13)	18.4*** (3.48)
1994	20.4 (0.42)	0	7.1 (0.20)	10.4*** (3.21)	3.4 (0.14)	21.6*** (3.49)
1997	18.7 (0.42)	0	7.0 (0.21)	7.8** (3.59)	3.7 (0.16)	16.5*** (4.13)
2000	15.4 (0.38)	0	5.7 (0.19)	8.2** (3.99)	3.1 (0.14)	16.6*** (4.50)
Panel B: Transfer to extreme-poor, non-FSP households with children						
1988	18.8 (0.41)	0	6.9 (0.20)	5.8 (3.57)	3.5 (0.14)	15.3*** (4.07)
1991	20.5 (0.40)	0	7.2 (0.19)	8.4*** (3.06)	3.4 (0.13)	21.4*** (3.31)
1994	20.4 (0.42)	0	7.1 (0.20)	9.6*** (3.20)	3.3 (0.14)	23.9*** (3.36)
1997	18.7 (0.42)	0	7.0 (0.21)	7.2** (3.58)	3.6 (0.16)	18.6*** (3.92)
2000	15.4 (0.38)	0	5.7 (0.19)	7.5* (3.97)	3.0 (0.14)	18.7*** (4.35)

Note: See notes for table 2.

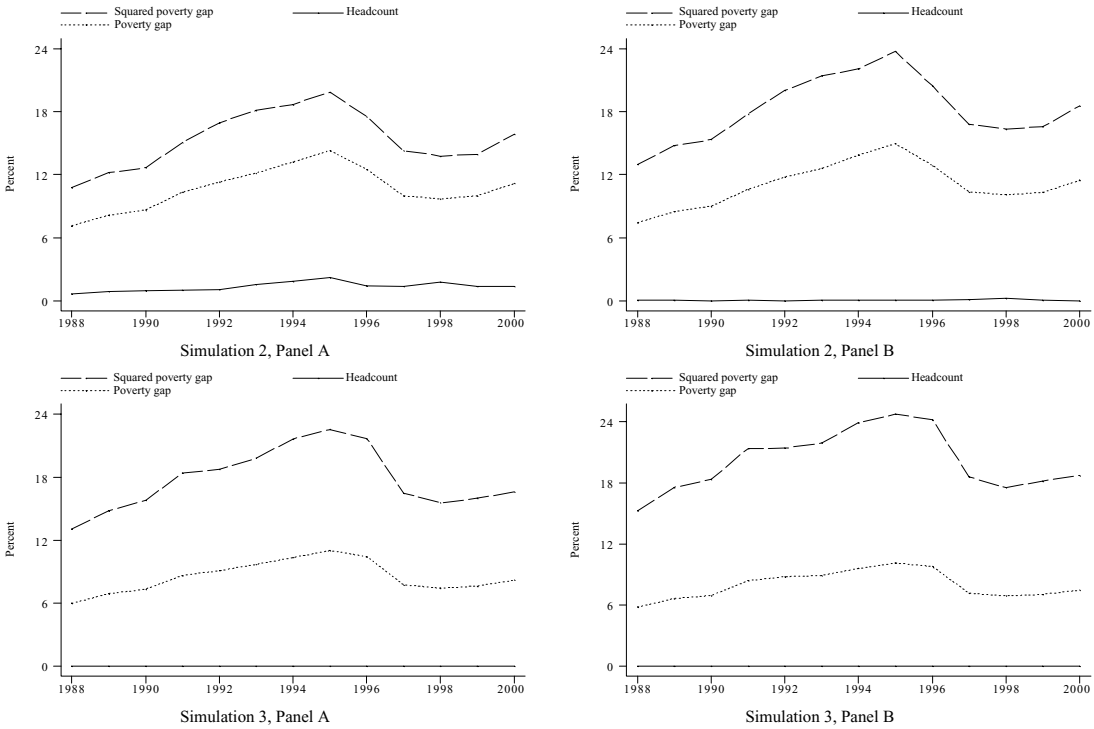

Figure 2. Percentage reduction in child poverty from simulated transfers

non-FSP households with children is more effective in reducing the severity of child poverty. Despite this difference across the simulations, figure 2 plots out the poverty reduction from each of the simulations and reveals several similarities.

For each simulation, the transfers have the greatest effect on reducing the squared poverty gap index, followed by the reduction in the poverty gap index, but there is essentially no reduction in the headcount of child poverty. It is also noteworthy that the effectiveness of the transfers drops markedly after 1995 for all simulations. The primary factor determining the decline over all simulations is the drop in overall participation during the late 1990s. Because

the simulations are designed to be "revenue-neutral" (taking away from those above the poverty line and redistributing to those below), the reduction in poverty is affected by the total level of funds disbursed to the nonpoor households. As participation declined after 1995, the simulated transfer amount declines, and the poverty reduction effect is diminished.

We note that that these simulations are not intended to represent optimal reallocations, but rather they provide further support for our primary finding and illustrate an additional point. First, food stamps do not significantly reduce the incidence of poverty, but they do significantly reduce the depth and severity of poverty, and thereby improve the well-being of the poor. Second, the simulations illustrate that simple reallocations of benefits that target poor households with children could even further reduce the depth and severity of child poverty.[19]

Conclusion

Using data from the 1989 to 2001 March Supplement of the Current Population Survey, we first verify the well-known result that the incidence of child poverty is much greater than the incidence of poverty for the population in general. We extend the current understanding of child poverty by showing that the depth and severity of child poverty, indicated by the poverty gap and squared poverty gap indices, are also significantly higher than for the population in general.

We then examine the effect on child poverty of adding the value of food stamps to household income. Our results indicate that the incidence of child poverty, as measured by the headcount index, is not reduced much by food stamps. In contrast, the depth and severity of child poverty are significantly reduced by the Food Stamp Program. The average decline from 1988 to 2000 in the child poverty gap index was 20%, while the average decline in the squared poverty gap index for children was 28%. These results clearly show that an examination of only the headcount index, or incidence of poverty, would lead to the incorrect conclusion that food stamps do not have an important impact on the reduction of child poverty. Our analysis of the poverty gap and squared poverty gap index makes clear that the Food Stamp Program plays an important role in improving the welfare of children in low-income households.

In the last section of the article, we consider several potential changes to the Food Stamp Program and simulate their effect on child poverty. In the first simulation, our results indicate that an increase in benefit levels by 10% and 20% would not result in a large reduction of child poverty. The primary reason for this result is that a general increase in benefits would not be well targeted toward children living in poor households.

We then simulate the effect on child poverty of increasing food stamp benefits targeted to specific sub-populations of the poor. We first consider increasing benefit levels to poor and extreme-poor FSP households with children. We find that this potential change would be very effective in further reducing the depth and severity of child poverty. Not surprisingly, the decrease in the severity of child poverty is greatest when the increased benefits are targeted to the extreme-poor households with children.

The last simulation provides food stamps to poor and extreme-poor households with children who were not receiving stamps. This simulated program change would likely be much more difficult to implement than the other simulations because they target households that are either unaware of the program, have decided not to participate, or are not eligible under the program rules. Our analysis indicates that this sort of increase in participation rates does not necessarily result in a greater reduction in child poverty rates. The simulation that increases benefits to all poor households that already participate in the Food Stamp Program reduces the depth of poverty by a greater amount than the simulated increase in participation rates.

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[19] We examined numerous permutations of these simulations such as redistributions to all poor FSP households (not specifically those with children), extreme-poor FSP households, poor non-FSP households, extreme-poor non-FSP households. Across all simulations, there is very little reduction in the incidence of poverty and child poverty, but there are significant reductions in the depth and severity of these measures. These results are available from the authors upon request.

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